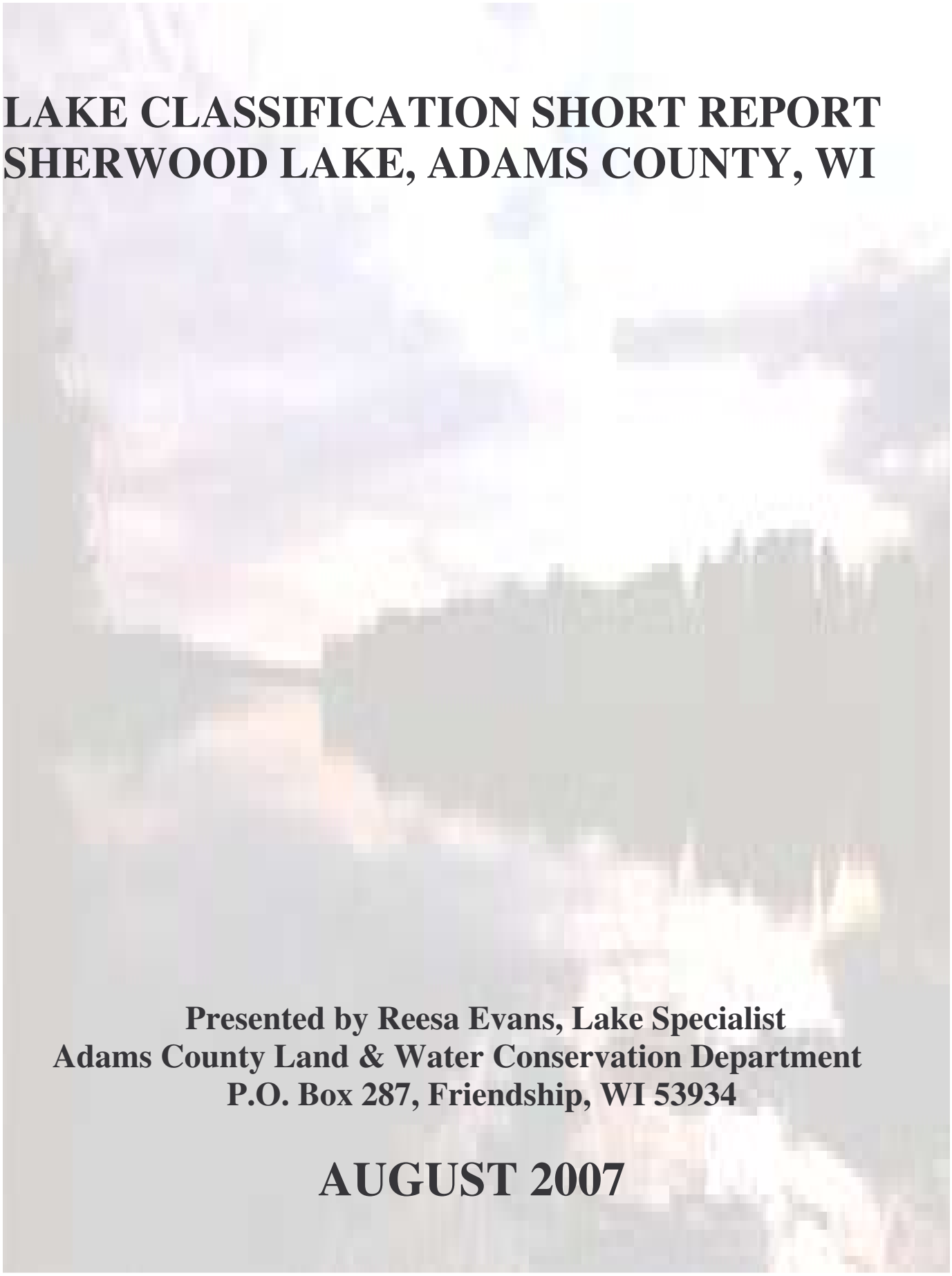
LAKE CLASSIFICATION SHORT REPORT
SHERWOOD LAKE, ADAMS COUNTY, WI



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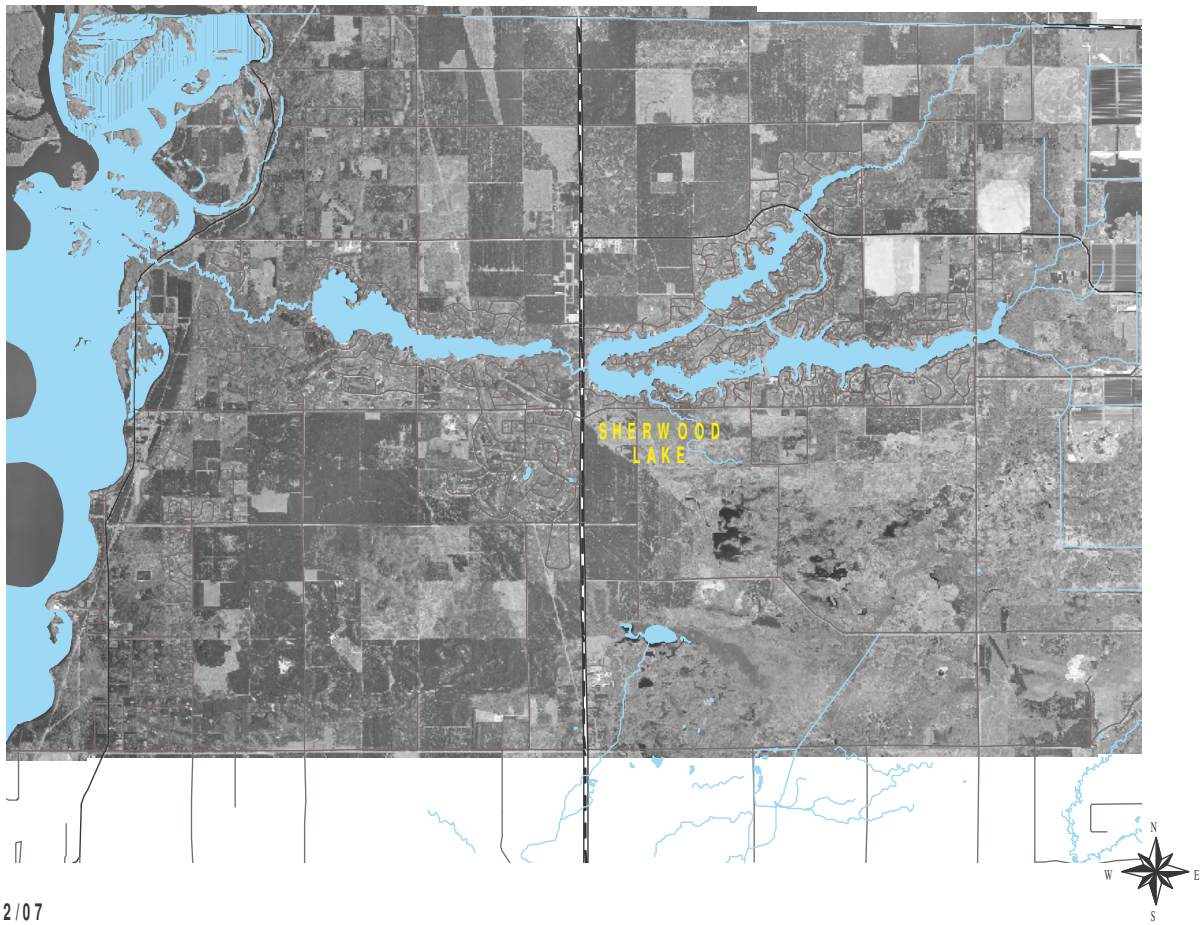
Introduction

Information about Sherwood Lake: Sherwood Lake is located in the Town of Rome, Adams County, WI, in the south central part of Wisconsin. The impoundment is slightly over 243 surface acres in size. Maximum depth is 24', with an average depth of 8'. Both Upper and Lower Camelot Lakes flow through dams into Sherwood Lake. Sherwood Lake flows through a dam into Arrowhead Lake. There is a public boat launch on Sherwood Lake on the southwest edge of the lake owned by the Parks Department of Adams County. Heavy residential development around the lake is found along most of the lakeshore.



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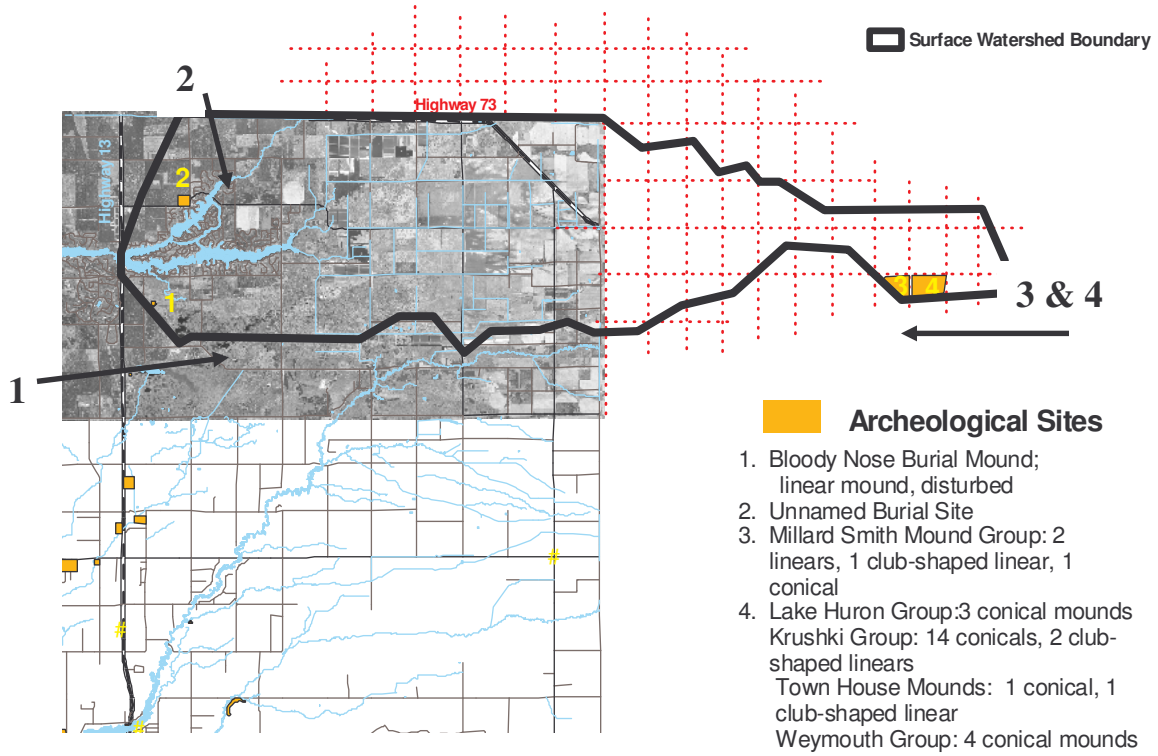
Archeological Sites
Sherwood Lake Watersheds



RE:4/05: revised 7/06

Conical mound

There are many Native American archeological sites in Adams County, with several being located right around in the Tri-Lakes watersheds. These mounds can be conical, linear or effigy (animal shapes) shapes. In order to preserve Native American heritage, federal and state laws on Native American burials require permission of the federal government and input from the local tribes before further disturbance.

Land Use

The ground watershed for Sherwood Lake is small. The surface watershed is very large, encompassing the Camelot Lakes and their surface watershed, which extends eastward into the next county. Studies have shown that lakes are products of their watersheds. Land use right around a lake also can have a great impact on the water quality of that lake, especially in the amount and content of stormwater runoff from the surface. Land use in both watersheds is concentrated. Runoff volume is affected by the amount of impervious surface, the soil type and the slope of the area. Natural landscapes tend to have very low surface runoff.

Land use in acres and percent of total are shown on the chart below:

	Ground		Surface		Total	
Sherwood Lake	**Acres**	**% of Total**	**Acres**	**% of Total**	**Acres**	**% of Total**
Agriculture--Non Irrigated	0	0.00%	8598.14	16.93%	8598.14	16.11%
Agriculture--Irrigated	0	0.00%	14,712.35	28.97%	14712.35	27.57%
Grassland/Pasture	173.89	6.73%	3983.82	7.85%	4157.71	7.79%
Residential	819.83	31.73%	2,627.44	5.17%	3447.27	6.46%
Water	347.78	13.46%	603.9	1.19%	951.68	1.78%
Woodland	1242.2	48.08%	20,252.97	39.89%	21495.17	40.28%
total	2583.7	100.00%	50778.62	100.00%	53362.32	100.00%

The largest land use category overall in the Sherwood Lake surface watershed is agriculture (both irrigated and non-irrigated). Over 23,000 acres of agricultural land use feeds into Sherwood Lake after traveling through the Camelot Lakes. Agriculture may significantly to the amounts of nutrients in water bodies.

Woodland is the second largest land use category in the Sherwood Lake surface watershed and the largest land use in Sherwood Lake's ground watershed. However, since forest floors are often full of leaves, needles and other duff, runoff from forested lands is may be more filtered than that from agricultural or residential lands.

Residential land use is the second most common land use category in the Sherwood Lake ground watershed, especially around the lake itself, where residential land use is most concentrated. This land use category, in some instances, may also contribute a significant amount of nutrients to the water from stormwater runoff, mowed lawns, and impervious surfaces.

There are several wetlands located in the Tri-Lakes watersheds. Wetlands play an important role in water quality by trapping many pollutants in runoff waters and by serving as buffers to catch and control what would otherwise be uncontrolled water and pollutants. Wetlands also play an essential role in the aquatic food chain, thus affecting fishery, and also serve as spaces for wildlife habitat, wildlife reproduction & nesting, and wildlife food.

Most of the wetlands in the Tri-Lakes watersheds are east of the Camelot Lakes, where they can serve as filters for what enters the Tri-Lakes System. It is essential to preserve these wetlands for the continued (and hopefully improved) health of Tri-Lakes waters.

Example of a Lake Shore Wetland

Like many lakes in Wisconsin, Sherwood Lake is a phosphorus-limited lake. This means that of the pollutants that end up in the lake, the one that is in the shortest supply and most affects the overall quality of the lake water is phosphorus. Land use types play a major role in determining the amount of phosphorus being loaded into the lake. Recent statistics and computer modeling suggest that the surface watershed is the greatest contributor of phosphorus to Sherwood Lake.

Some aspects of phosphorus loading can't be modified by human behavior—they are simply part of the natural landscape. However, phosphorus loading from agriculture, residential and septic use of the land can be increased or decreased by human activities.

For example, decreasing the phosphorus input in these three areas by only 10% would result in 276.3 fewer pounds per year of phosphorus. This may not sound like much until one considers that one pound of phosphorus can produce up to 500 pounds of algae. A phosphorus decrease of 276.3 pounds per year becomes 138,150 **fewer** pounds of algae per year!

MOST LIKELY ANNUAL PHOSPHORUS LOADING--Current		
	% Loading	**lb/yr**
Grassland/Pasture	0.7%	19.8
Residential	5.2%	147.4
Other Water	0.5%	13.2
Woodland	2.0%	55
Septics	5.2%	145.2
Lake Surface	1.2%	33
Greater Surface Watershed	85.2%	2395.58
Total in pounds/year	100.0%	2809.18

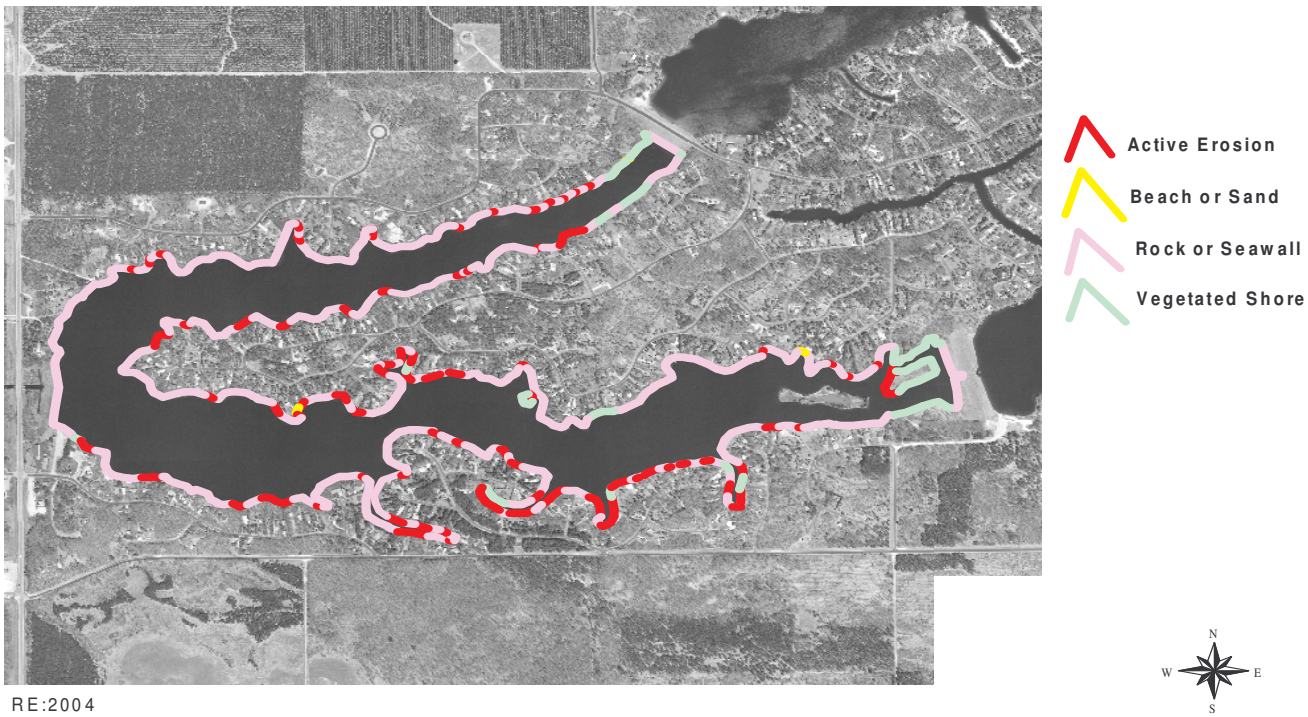
LAND USE	**lb/yr**	**-10%**	-25%	-50%
Grassland/Pasture	19.8	17.82	14.85	9.90
Residential	147.4	132.66	110.55	73.70
Other Water	13.2	13.20	13.20	13.20
Woodland	55	49.50	41.25	27.50
Septics	145.2	130.68	108.90	72.60
Lake Surface	33	33.00	33.00	33.00
Greater Surface Watershed	2395.58	2156.02	1796.69	1197.79
Total	2809.18	2532.88	2118.44	1427.69

Shoreland Use

Sherwood Lake has a total shoreline 7.8 miles (41,184 feet) Most of the lakeshore is in residential or beach club use. Some of the areas near the shore are steeply sloped; some are also soft and/or not well–vegetated.

Only 21.5% of the Sherwood Lake shore has native vegetation. 77.54% of the shore has been disturbed and is currently covered by mowed lawn, rock riprap, some kind of seawall, hard structures (piers, etc.), erosion and/or sand.

A 2004 shore survey showed that very little of Sherwood Lake's shore had an "adequate buffer." An "adequate buffer" is a native vegetation strip at least 35 feet landward from the shore. Most of the "inadequate" buffer areas were those with rock or seawall, hard structures, beach, active erosion or mowed laws. In a few instances, those with insufficient native vegetation at the shoreline to cover 35 feet landward from the water line were also called "inadequate."



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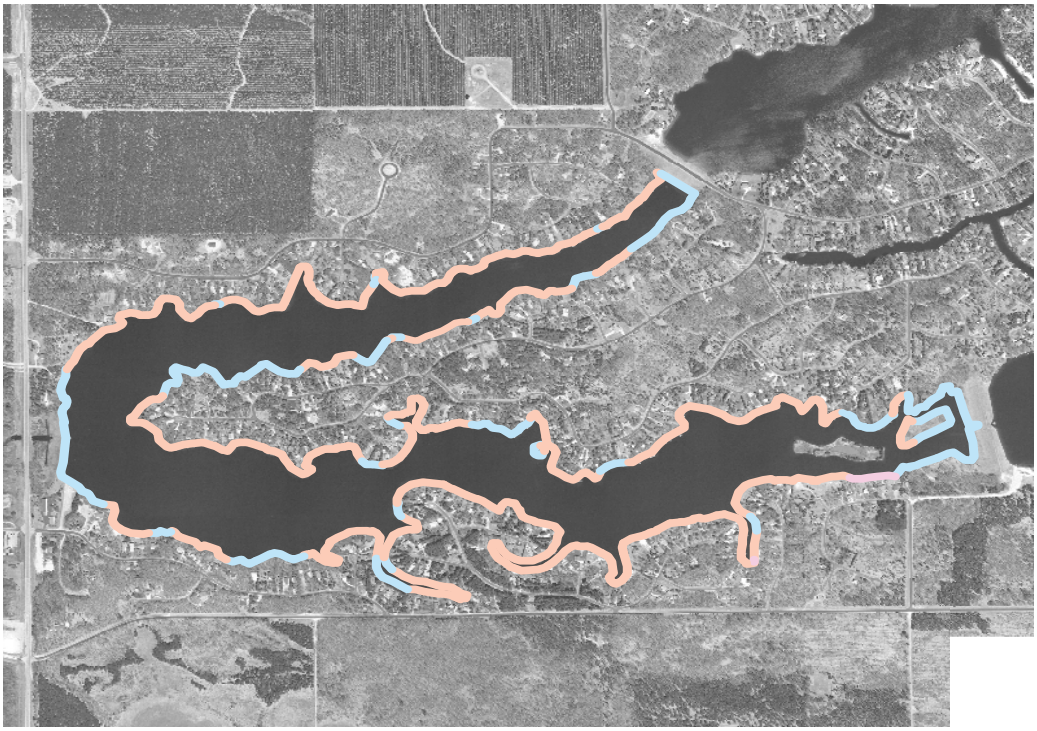
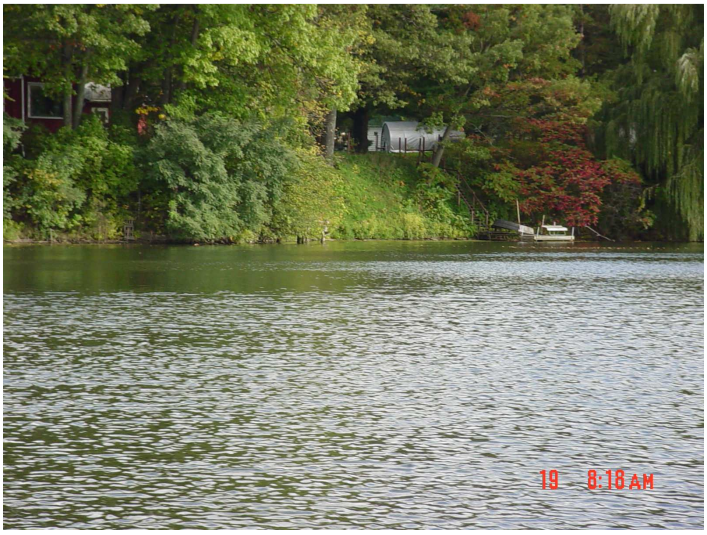
Examples of Adequate Buffers

Sherwood Lake--Buffers



RE:2004

Shoreland buffers are an important part of lake protection and restoration. These buffers are simply a wide border of native plants, grasses, shrubs and trees that filter and trap soil & similar sediments, fertilizer, grass clippings, stormwater runoff and other potential pollutants, keeping them out of the lake. A 1990 study by the Wisconsin Department of Natural Resources of Wisconsin shorelines revealed that a buffer of native vegetation traps 5 to 18 times more volume of potential pollutants than does a developed, traditional lawn or hard-armored shore. The filtering process and bank stabilization that buffers provide help improve a lake's water quality, including water clarity.



Example of Adequate Buffer

Example of Inadequate Buffer

Vegetated shoreland buffers help stabilize shoreline banks, thus reducing bank erosion. The plant roots give structure to the bank and also increase water infiltration and decrease runoff. A vegetated shore is especially important when shores are steep and sandy, as are many of the Sherwood Lake shores.

Water Quality Information

One of the measures Wisconsin uses to give a general estimate of a lake's water quality is the **trophic state index.** This index looks at a lake's water clarity, its amount of total phosphorus (the element most related to aquatic plant and algal growth), and its chlorophyll-a level (chlorophyll-a is a pigment used by algae for photosynthesis).

Depending on the trophic index score, lakes are then classified as **Oligotrophic** (good)**, Mesotrophic** (fair) **or Eutrophic** (poor)**.**

- **Good:** Oligotrophic lakes have clear, deep water with few algal blooms. Larger game fish are often found in such lakes.
- **Fair:** Mesotrophic lakes have more aquatic plant and algae production, with occasional algal blooms and a good fishery. The water is usually not as clear as that of oligotrophic lakes.
- **Poor:** Eutrophic lakes are very productive, with lots of aquatic plants and algae. Algal blooms are often frequent in these lakes. They may have a diverse fishery, but rough fish (such as carp) are also common. Water is often cloudy or murky. Small shallow lakes are more likely to be eutrophic.

Sherwood Lake's overall TSI is 57

Score	TSI Level Description
30-40	**Oligotrophic:** clear, deep water; possible oxygen depletion in lower depths; few aquatic plants or algal blooms; low in nutrients; large game fish usual fishery
40-50	**Mesotrophic:** moderately clear water; mixed fishery, esp. panfish; moderate aquatic plant growth and occasional algal blooms; may have low oxygen levels near bottom in summer
50-60	**Mildly Eutrophic:** decreased water clarity; anoxic near bottom; may have heavy algal bloom and plant growth; high in nutrients; shallow eutrophic lakes may have winterkill of fish; rough fish common
60-70	**Eutrophic:** dominated by blue-green algae; algae scums common; prolific aquatic plant growth; high nutrient levels; rough fish common; susceptible to oxygen depletion and winter fishkill
70-80	**Hypereutrophic:** heavy algal blooms through most of summer; dense aquatic plant growth; poor water clarity; high nutrient levels

Water clarity readings are usually taken by using a Secchi disk (shown at right). **Average summer Secchi disk clarity in Sherwood Lake in 2004-2006 was 4.36 feet**. This places Sherwood Lake's water clarity in the "poor" to "fair" category. In the 1980s, water clarity averaged 5.4'; in the 1990s, the average was 5.6'. The current average is over a foot lower than those numbers. Water clarity can be reduced by turbidity (suspended materials such as algae and silt), frequent disturbance from shoreland development and boat traffic, and dissolved organic chemicals that color or cloud the water.

Increased phosphorus levels in a lake will feed algal blooms and also may cause excess plant growth. **The 2004-2006 summer average phosphorus concentration in Sherwood Lake was 31.67 micrograms/liter.** This is above the 30 micrograms/liter recommended for impoundments in Wisconsin, but only slightly. This reading places Sherwood Lake in the "fair" category for total phosphorus. Total phosphorus average in the 1990s was 30.72 micrgrams/liter, or about the same as it is now. However, phosphorus needs to be monitored on an ongoing basis because it is the element most likely to affect the lake water quality.

The third measure used in trophic state classification is the amount of chlorophyll-a contained in the lake. The amount of chlorophyll-a found in a lake is an indication about the amount of algae in the lake. **The 2004-2006 summer average chlorophyll-a concentration in Sherwood Lake was 20.7 micrograms/liter.** This level gives Sherwood Lake a "poor" ranking for chlorophyll-a. With such a level, frequent algal blooms would be expected on the lake, especially in hotter weather. However, this average is better than the prior average for the 1990s of 24.7 micrograms/liter.

In-Lake Habitat

Aquatic Plants

A diverse aquatic plant community plays a vital role in improving water quality, providing valuable habitat resources for fish and wildlife, resisting invasions of non-native species and checking excessive growth of the most tolerant species.

An updated aquatic plant survey was performed in 2006. The 1.5'-5' depth zone supported the most abundant aquatic plant growth, although the 5'-10' depth wasn't far behind. The Sherwood Lake aquatic plant community is characterized by below average quality and limited species diversity. It is dominated by aquatic species that can survive frequent disturbances. *Chara* spp (muskgrass), *Potamogeton crispus* (curly-leaf pondweed, an exotic invasive), and *Potamogeton pectinatus* (sago pondweed) were the most common aquatic species. All of these plants occurred at higher than average growth density where they were present.

Important to maintaining a diverse aquatic plant community is an integrated aquatic plant management plant that controls the invasive plants in the lake. The most prevalent invasive exotic in Sherwood Lake is currently Curly-Leaf Pondweed. However, *Myriophyllum spicatum* (Eurasian watermilfoil), another aggressive invasive, was also found in the lake in 2006. *Lythrum salicaria* (Purple Loosestrife), an invasive shore plant, has also been found on Sherwood's shores. During the 2006 plant survey, a new invasive, *Nasturtium microphyllum* (watercress) was found in the lake in the 0-1.5' depth zone.

Curly-Leaf Pondweed

Purple Loosestrife

Eurasian Watermilfoil

More detailed information can be found in the aquatic plant report of the 2006 survey, available on request from the WDNR or Adams County Land & Water Conservation Department.

***Chara* spp**

Potamogeton pectinatus

Most common aquatic plants:

New invasive:

Nasturtium microphyllum

Fishery/Wildlife/Endangered Resources

WDNR stocking and fishery inventories go back to 1968, when the lake was stocked after a chemical eradication of fish in 1967 to get rid of the rough fish population. Stocking in 1968 consisted of bluegills, largemouth bass, northern pike and walleye. A follow-up inventory in 1969 found that bluegills and pumpkinseeds were abundant; largemouth bass, northern pike, walleye and yellow perch were common; and shiners and white suckers were scarce. The most recent survey, done in 2002, found that bluegills and largemouth bass were abundant; black crappie, walleye and yellow perch were common; northern pike was scarce. Between 1970 and 2000, thirteen other fish inventories were performed by the WDNR. In addition to those fish already mentioned, through the years were also found brown bullheads, black bullheads, yellow bullheads, yellow suckers, golden shiners, and emerald shiners.

Muskrat are also known to use Tri-Lakes shores for cover, reproduction and feeding. Seen during the field survey were various types of waterfowl and songbirds. Frogs and salamanders are known, using the lake shores for shelter/cover, nesting and feeding. Turtles and snakes also use this area for cover or shelter in this area, as well as nested and fed in this area. Upland wildlife feed and nest here as well.

There are several endangered resources in the Sherwood Lake surface watershed. Natural communities reported here include northern sedge meadow, northern wet forest, pine barrens and shrub-carr. Endangered plants known in the area include *Polygala cruciata* (crossleaf milkwort), *Juncus marginata* (grassleaf rush), and *Bartonicia virginica* (yellow screwstem).

YELLOW SCREWSTEM

CROSSLEAF MILKWORT

Recommendations

Lake Management Plan

- When the Tri-Lakes Management District revises the lake management plan, it needs to make sure the plan includes at least the following aspects concerning the management of the lake: integrated aquatic species management; control/management of invasive species; wildlife and fishery management; nutrient budgeting; shoreland protection; water quality protection.
- The Sherwood Property Owner's Association should participate in the revision process and implementation of the lake management plan.

Watershed Recommendations

- Since computer modeling results suggest that input of nutrients, especially phosphorus, are a factor that needs to be explored for Sherwood Lake, it is recommended that both the surface and ground watersheds be inventoried, documenting any of the following: runoff from any livestock operations that may be entering the surface water; soil erosion sites; agricultural producers not complying with nutrient management plans and/or irrigation water management plans.
- If such sites are documented, a statement outlining the Sherwood Lake Association and Tri-Lake Management District's encouragement to Adams County Land & Water Conservation Department and landowners to design and implement practices to address the sites.

Water Quality Recommendations

- All lake residents should practice best management on their lake properties, including keeping septic systems maintained in proper condition and pumped every three years, eliminating the use of lawn fertilizers, cleaning up pet wastes and not composting near the water.
- Reducing the amount of impervious surface around the lake and management of stormwater runoff will also help maintain water quality.
- Residents should become involved in the Citizen Lake Water Monitoring Program. This program includes water quality monitoring, invasive species monitoring, and Clean Boats, Clean Waters.
- Broad-scale restoration of native vegetation at the shore is needed to help improve water quality. Studies show that the frequency and density of the most sensitive plant species is less at disturbed shores than at those with native vegetation. These plants are indicators of water quality.

Aquatic Plant Recommendations

- All lake users should protect the aquatic plant community in Sherwood Lake by assisting in revising implementing an integrated aquatic plant management plan that uses multiple methods of control.
- The Tri-Lakes Management District should maintain exotic species signs at the boat landings and contact DNR if the signs are missing or damaged.
- The Tri-Lakes Management District should continue monitoring and control of Eurasian Watermilfoil and Curly-Leaf Pondweed, maintaining the most effective methods and modifying if necessary. The Sherwood Property Owners Association should assist in these efforts. Residents may need to hand-pull scattered plants.
- Lake residents should get involved in the county-sponsored Citizen Aquatic Invasive Species Monitoring Program. This will allow not only noting changes in the Eurasian Watermilfoil pattern and Curly-Leaf Pondweed, but also for other invasives. Noting the presence and density of invasives early is the best way to take preventive action to keep them from becoming a bigger problem.